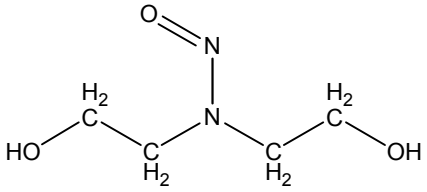
N-NITROSODIETHANOLAMINE
CAS No. 1116-54-7
First Listed in the *Second Annual Report on Carcinogens*



CARCINOGENICITY

N-Nitrosodiethanolamine is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC V.17, 1978; IARC S.4, 1982). When administered in the drinking water, *N*-nitrosodiethanolamine induced hepatocellular carcinomas and renal adenomas in rats. When administered subcutaneously, the compound caused nasal cavity adenocarcinomas, papillary tumors of the trachea, hepatocellular adenomas, and injection site fibrosarcomas in hamsters of both sexes (IARC V.17, 1978; IARC S.4, 1982).

There are no adequate data available to evaluate the carcinogenicity of *N*-nitrosodiethanolamine in humans (IARC S.7, 1987).

PROPERTIES

N-Nitrosodiethanolamine is a yellow, viscous oil that is miscible with water in all proportions. It is soluble in polar solvents and insoluble in nonpolar organic solvents. *N*-Nitrosodiethanolamine is sensitive to light, especially ultraviolet light and undergoes relatively rapid photolytic degradation.

USE

The presence of *N*-nitrosodiethanolamine is widespread in the environment. There is presently no known commercial use for this compound. It is used primarily as a research chemical.

PRODUCTION

The 1979 TSCA Inventory reported production of 5,000 lb of *N*-nitrosodiethanolamine by one U.S. manufacturer in 1977 (TSCA, 1979). No other production data, nor any import or export data, are available.

EXPOSURE

The primary routes of potential human exposure to *N*-nitrosodiethanolamine are dermal contact, ingestion, and inhalation. *N*-Nitrosodiethanolamine is a known contaminant of cosmetics, lotions, shampoos, cutting fluids, certain pesticides, antifreeze, and tobacco at

concentrations ranging from 1 to 130,000 ppb. As of 1980, FDA analyzed 335 cosmetic products and found that 42% were contaminated with *N*-nitrosodiethanolamine. This compound has been detected in facial cosmetics at concentrations ranging from 42 to 49,000 µg/kg, in lotions from < 10 to 140 µg/kg, and in shampoos from < 10 to 260 mg/kg (IARC V.17, 1978). *N*-Nitrosodiethanolamine is present in most cutting fluids containing triethanolamine and sodium nitrite at concentrations varying from 0.02% to 3% (IARC V.17, 1978). An atrazine pesticide formulation emulsified with triethanolamine was reported to contain 0.5 mg/kg *N*-nitrosodiethanolamine. *N*-Nitrosodiethanolamine is also present in tobacco and tobacco smoke. It has been detected in cigarette smoke at concentrations of 24-36 ng/cigarette and in smokeless tobacco products at 0.2-6.8 µg/g (Brunnemann & Hoffmann, 1981; Brunnemann et al., 1982). The presence of *N*-nitrosodiethanolamine in tobacco is attributed to maleic hydrazide-diethanolamine which is a herbicide commonly applied to tobacco. Occupational exposure to *N*-nitrosodiethanolamine could possibly occur during the use of synthetic cutting fluids to reduce the temperature of the metal-tool interface during metal cutting or grinding. Various synthetic cutting fluids are produced by over 1,000 companies in the United States, and NIOSH estimates that 780,000 persons are potentially exposed to cutting fluids during their manufacture and use (Sittig, 1985). *N*-Nitrosodiethanolamine was not included in the National Occupational Hazard Survey or the National Occupational Exposure Survey conducted by NIOSH.

REGULATIONS

In 1980 CPSC preliminarily determined that *N*-nitrosodiethanolamine was not present in consumer products under its jurisdiction. Subsequently, public comment was solicited to verify the accuracy of this information; no comments were received. Pending receipt of new information, CPSC plans no action on this chemical. EPA regulates *N*-nitrosodiethanolamine under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). It is subjected to report/recordkeeping requirements under the hazardous waste disposal rule of RCRA, and a reportable quantity (RQ) of 1 lb has been established for *N*-nitrosodiethanolamine under CERCLA. FDA has alerted the cosmetic industry to the presence of *N*-nitrosodiethanolamine in a number of products and is conducting a survey for product contamination. Regulations are summarized in Volume II, Table B-100.